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AEX800/T

User

601-00008A

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CE Mark
2002/95/EC Restrictions on Hazardous Substances (RoHS
lead free exemption (Annex C)

Telecom:

FCC Part 68, ANSI/ITA-968-A, Including Amendment A

EMC:

FCC Part 15 Class A
EN55022/CISPR22 Class A
EN55025
IEC 61000

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must be provided to the telephone company.

A plug and jack used to connect this equipment to the pre
and telephone network must comply with the applicable F
rules and requirements adopted by the ACTA.

The REN is used to determine the number of devices that
connected to a telephone line. Excessive RENs on a telep
result in the devices not ringing in response to an incomi
but not all areas, the sum of RENs should not exceed five
certain of the number of devices that may be connected to
determined by the total RENs, contact the local telephone
products approved after July 23, 2001, the REN is part of
identifier that has the format US:AAAEQ##TXXXX. The
represented by ## are the REN without a decimal point (e
of 0.3).

If your 800 Series card causes harm to the telephone netw
telephone company may notify you in advance that tempo
discontinuance of service may be required. But if advance
practical, the telephone company will notify you as soon
Also, you will be advised of your right to file a complaint
you believe it is necessary.

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Inc. at 1.877.DIGIUM.1 (1.877.344.4861) for repair and
information. If the equipment is causing harm to the telep
the telephone company may request that you disconnect t
until the problem is resolved.

Connection to party line service is subject to state tariffs. C
public utility commission, public service commission, or
commission for information.

Federal Communications Commission Part 15

This device complies with Part 15 of FCC rules. Operatio
the following two conditions: (1) This device may not cau
interference, and (2) This device must accept any interfer
including interference that may cause undesired operation

Industry Canada

This Class A digital apparatus meets all requirements of t
Interference-Causing Equipment Regulation.
Cet appareil numerique de la class A respecte les exigence
sur le Material Brouilleur du Canada.

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Chapter/ Appendix	Title	Descriptio
1	Overview	Identifies the card and type of m with your 800 Series card. This c applications and uses of the 800 real world.
2	Card Installation	Provides instructions for installi PC, acquiring correct drivers, an compatibility.
3	Configuration	Provides examples for configuri
4	FXS and FXO Explained	Describes the FXO (Foreign Exc FXS (Foreign Exchange Station) significance.
5	Troubleshooting	Explains resolutions to common frequently asked questions pertai installation and usage.
A	Pin Assignments	Lists the connectors and pin assi
B	Specifications	Details card specifications.
C	Glossary and Acronyms	A list of terms and acronyms use manual.

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precautions for handling devices. Wear a properly
electrostatic discharge (ESD) wrist strap while han

The Electrical Hazard Symbol indicates a possibili
shock when operating this unit in certain situations
risk of damage or injury, follow all steps or proced
instructed.

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Electrical Shock.
To reduce the risk of injury, damage to the unit or yo
not attempt to touch the modules while they are pow
should be securely closed before power is applied to

Alarm Dialing Equipment.
If your home has specially wired alarm equipment c
telephone line, ensure the installation of the 800 Ser
disable your alarm equipment. If you have questions
telephone company or a qualified installer.

Servicing.
Do not attempt to service this card unless specifically
so. Do not attempt to remove the card from your equ
power is present. Refer servicing to qualified service

Water and Moisture.
Do not spill liquids on this unit. Do not operate this
wet environment.

Heat.
Do not operate or store this product near heat sourc
radiators, air ducts, areas subject to direct, intense s
products that produce heat.

Caution.
To reduce the risk of fire, use only No. 26 AWG or la
telecommunication wiring for network connections.

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not instructed to do so. Refer servicing to qualified s

Save these instructions for future refe

Service Personnel Cautions

Warning.
This card must be used with the PC lid screwed dow
Telecommunications network voltages exist inside th
The PC must be shut down and telecommunications
shall be removed before opening the PC.

Electrical Shock.
To reduce the risk of injury, damage to the unit or yo
not attempt to touch the modules while they are pow
should be securely closed before power is applied to

Servicing.
Disconnect telecommunications network cable befo
cover or removing the card from the motherboard.

Labeling.
For safety reasons, only connect equipment with a
Telecommunications Compliance label. This include
equipment previously labelled **Permitted** *or* **Certif**

Caution.
Only connect regulatory equipment (approved for us
country) to the telecommunications network voltage

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What is Asterisk®? . . . . . .
Asterisk as a Switch (PBX) . . . . . .
Asterisk as a Gateway . . . . . .
Asterisk in the Call Center . . . . . .
Asterisk in the Network . . . . . .
Asterisk Everywhere . . . . . .

Chapter 2
Card Installation . . . . . .
Unpacking the Card . . . . . .
Shipment Inspection . . . . . .
Module Identification . . . . . .
Port Identification . . . . . .
Card Identification . . . . . .
FXS and FXO Connection . . . . . .
Slot Compatibility . . . . . .
Hardware Installation . . . . . .
Software Installation . . . . . .
Installing Asterisk . . . . . .

Chapter 3

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Chapter 4
FXS and FXO Explained . . . . . .
Identification. . . . . .
FXS Module . . . . . .
FXO Module . . . . . .
Using Your 800 Series Card . . . . . .

Chapter 5
Troubleshooting . . . . . .

Appendix A
Pin Assignments . . . . . .

Appendix B
Specifications . . . . . .

Appendix C
Glossary and Acronyms . . . . . .

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Figure 7: Example dmesg Screen Shot . . . . . .
Figure 8: Sample Application . . . . . .

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is accomplished through phone lines connected to the FX
Exchange Office) ports and phones connected via the FX
Exchange Station) ports. The cards allow Asterisk to con
phone network, creating an office type telephony environ

There are a variety of applications where the 800 Series c
or AEX800) can prove useful. An example is provided in
figure.

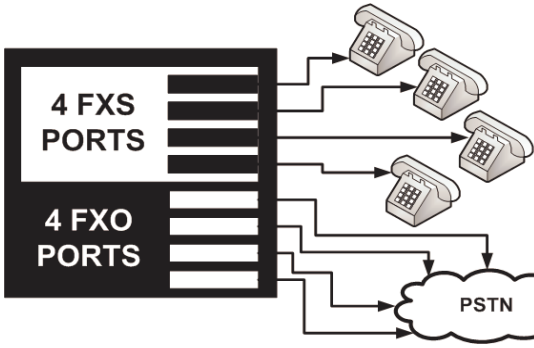

Figure 1: Sample Card Application

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The 800 Series cards, unless otherwise equipped, utilize A
perform software-based echo cancellation. Asterisk main
of open source echo cancelers. These open source echo ca
a moderate level of echo cancellation, but are not capable
higher levels of, or more advanced, echoes.

Digium recommends that those users concerned about ec
purchase the VPMADT032 hardware echo cancellation m
VPMADT032 may be combined with both the TDM800P

The VPMADT032 is designed to handle up to 128ms of e
across all channels and provides a G.168 echo cancellatio

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for download free of charge. Asterisk is the most popular
software available, with the Asterisk Community being th
in VoIP.

Asterisk as a Switch (PBX)

Asterisk can be configured as the core of an IP or hybrid
calls, managing routes, enabling features, and connecting
outside world over IP, analog (POTS), and digital (T1/E1

Asterisk runs on a wide variety of operating systems inclu
Mac OS X, OpenBSD, FreeBSD, and Sun Solaris. It prov
features you would expect from a PBX including many ad
that are often associated with high end (and high cost) pro
Asterisk's architecture is designed for maximum flexibilit
Voice over IP in many protocols, and can interoperate wit
standards-based telephony equipment using relatively ine
hardware.

Asterisk as a Gateway

It can also be built out as the heart of a media gateway, br
legacy PSTN to the expanding world of IP telephony. Ast
architecture allows it to convert between a wide range of c
protocols and media codecs.

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Asterisk in the Call Center

Asterisk has been adopted by call centers around the wor
flexibility. Call center and contact center developers have
ACD systems based on Asterisk. Asterisk has also added
existing call center solutions by adding remote IP agent c
advanced skills-based routing, predictive and bulk dialing

Asterisk in the Network

Internet Telephony Service Providers (ITSPs), competitiv
exchange carriers (CLECS) and even first-tier incumbent
discovered the power of open source communications wi
Feature servers, hosted services clusters, voicemail syste
calling solutions, all based on Asterisk have helped reduc
enabled flexibility.

Asterisk Everywhere

Asterisk has become the basis for thousands of communi
solutions. If you need to communicate, Asterisk is your a
information on Asterisk, visit http://www.asterisk.org or
www.digium.com.

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- **Shipment Inspection** on page 21
- **Module Identification** on page 21
- **Port Identification** on page 21
- **Card Identification** on page 25
- **FXS and FXO Connection** on page 27
- **Slot Compatibility** on page 27
- **Hardware Installation** on page 29
- **Software Installation** on page 32
- **Installing Asterisk** on page 36

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shipment.

Note: Only qualified service personnel should install t
should not attempt to perform this function themselve
must ensure that the equipment is permanently connec
pluggable type B or connected to a socket-outlet that h
to ensure that it is reliably earthed in accordance with
Electrical Code.

*This card is intended for installation in a Restrict
Location (RAL) only.*

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The 800 Series cards ships with FXO and/or FXS modules are identified by their color. Take a moment to identify w were shipped with your card.

- FXO (Foreign Exchange Office) modules are Red
- FXS (Foreign Exchange Station) modules are Green

See Figure 2 on page 23 for an example of the TDM800P with two of each single module.

See Figure 3 on page 24 for an example of the AEX800 c one of each quad module.

The 800 Series cards may also be combined with Digium based echo canceler, model VPMADT032. See Figure 3 o example of the AEX800 card shown with one of each qua module and the echo cancellation module.

Port Identification

Each card consists of eight RJ11 ports located on the brac correlates to a single module port (containing either FXO modules). The ports are numbered in sequence from one t port is Port 1 and the bottom port is Port 8. See Figure 2 o

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The ports available for use depend upon the type of modu
placement of the module on the card. The cards can accep
modules, for a total of 8 ports. If single modules are used
modules can occupy the same space as a quad module. Th
ports are identified on the card and their corresponding R
identified below. Please refer to Figure 2 for an example
modules, and Figure 3 for an example using quad module

If a single module is used, the RJ11 port available for use
corresponding to the location of the module on the card.
ports correspond to the single module ports as shown in F

- RJ11 Port 1 is used by Single Module Port 1
- RJ11 Port 2 is used by Single Module Port 2
- RJ11 Port 5 is used by Single Module Port 5
- RJ11 Port 6 is used by Single Module Port 6

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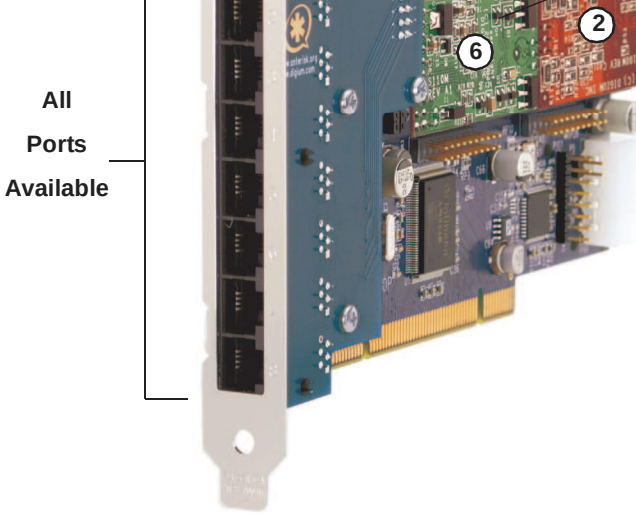

Figure 2: TDM800P Card with Four Single M

If a quad module is placed covering single module ports 1 module will use ports 1-4. Likewise, if a quad module is single module ports 3 and 4, the module will use ports 5 th 3 shows a AEX800 with two quad modules.

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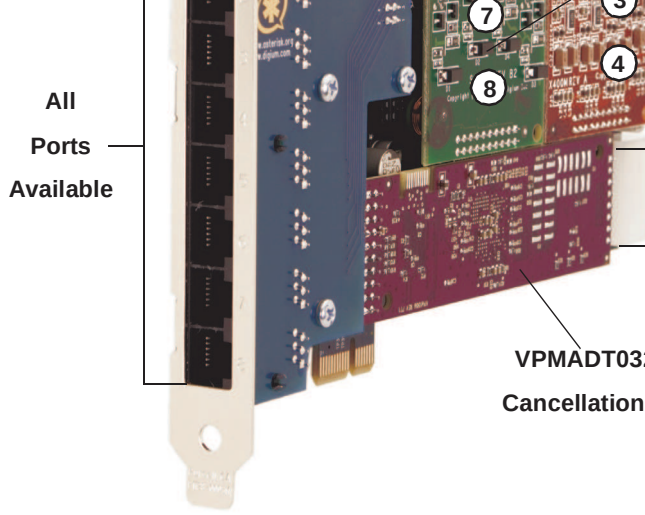

Figure 3: AEX800 Card with Two Quad M

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the most common AEX800 configurations. The lists are n
rather an example of the configurations available.

It is easiest to identify your card by understanding the nam
each card. The first digit is the maximum port count of th
second digit is the number of FXS (station) modules pres
The third digit is the number of FXO (office) modules pre

Table 1: Example TDM800P Card Configu

Card ID	FXO/FXS Ports
TDM801B	1 FXO module
TDM804B	4 FXO modules
TDM808B	8 FXO modules
TDM844B	4 FXS and 4 FXO modules
TDM880B	8 FXS modules

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AEX804B	4 FXO modules
AEX808B	8 FXO modules
AEX844B	4 FXS and 4 FXO modules
AEX880B	8 FXS modules

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Only qualified service personnel should continu
hardware installation and configuration of the 8
Users should not attempt to perform these functi

Slot Compatibility

Check the type of card you received to be sure it is compa
PCI slot. To determine which slot you have, identify it by
those shown in Figure 4 on page 28.

Slot Number:

0: AGP Pro Slot

1: 64-bit 5.0 volt PCI Slot

2: 64-bit 3.3 volt PCI Slot

3: 32-bit 5.0 volt PCI Slot

4: PCI Express Slot

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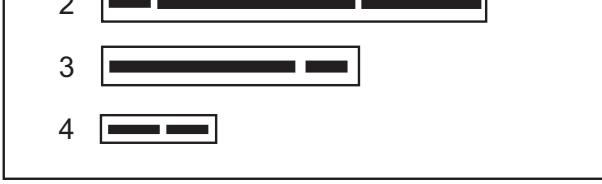

Figure 4: Motherboard Slots

The TDM800 card is a 32-bit 33MHz card keyed for univ
5.0 volt operation and works in any PCI 2.2 (or greater) c
This means that in the motherboard shown in Figure 4, th
will fit into Slots 1, 2, or 3 (PCI slots), but **will not** fit int
slot) or Slot 4 (PCI Express slot).

The AEX800 card is a PCI Express card. Slot 4, illustrate
lane (X1) PCI Express compliant slot. The AEX800 will
Express compliant slot, including lane lengths X4, X8, ar
means that in the motherboard shown in Figure 4, the AE
fit into Slot 4. The AEX800 **can not** be used in Slots 0 th

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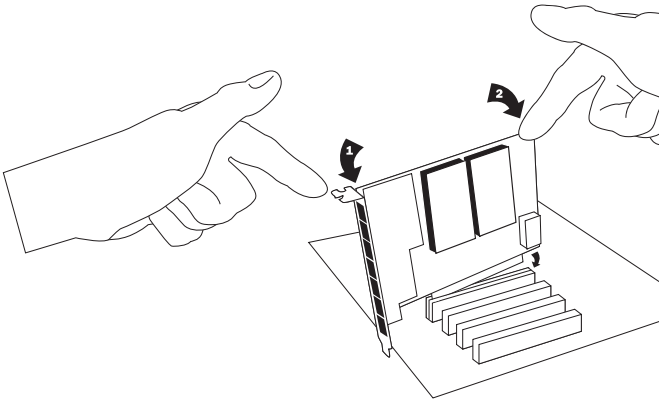

Figure 5: Insert the Card

4. If your card has any FXS modules, you will also need power cable from your computer's power supply to th card. Insert a four-pin 12 volt connector (disk drive p cable, e.g. hard drive) into the white plastic connecto the card. See Figure 6.

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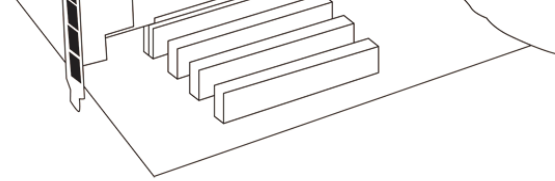

Figure 6: Connect Power for FXS Modu

Many modern PCs and servers do not have either spare or connectors. If you have FXS modules on your card and y does not have power cables available, then power must be 800 Series card by an alternate means. Digium provides a problem with the optional PWR2400B (available separate essentially a PCI bracket assembly that takes power from power supply and routes it to two 15" power cables inside You must have an available bracket slot to use the PWR2 PCI, PCI Express or AGP).

A strap on the PWR2400B card allows the two power cab power from the same DC supply. The PWR2400B comes supply capable of supporting up to 24 FXS ports each, dr loads of up to 5REN. If more than 24 FXS ports with hea connected to the PWR2400B, then a second Digium powe

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device, it is intended only to be used with UL Listed D
cards.

5. Replace the cover to your computer.

Electrical Shock.
To reduce the risk of injury, damage to the unit o
equipment, do not attempt to apply power to the
case is open.Personal injury or damage to the u
if the modules are touched while powered is app

6. Plug all outside phone lines to the FXO (red) ports an
phones to the FXS (green) ports as needed using a pa
punch block. See Table A-1 on page 57 for the pin as

Caution.
This unit must be connected to the Telecommuni
Network in your country using an approved line
Australia use only line cords complying with AC
Standard TS008.

Caution.
Only connect regulatory equipment (approved fo
specific country) to the telecommunications netw
circuit ports.

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Digium's software, including drivers and application soft
obtained from Digium's download server at:
http://downloads.digium.com

For an introduction to Asterisk, Digium's telephony softw
additional information on its configuration, setup, and fea
refer to:
http://www.asterisk.org

For the latest information on setting up and configuring D
for your Digium hardware product, please refer to the late
manual which is available from the product-specific docu
section at:
http://www.digium.com

To install your 800 Series card, you will need:

- Linux 2.6 kernel headers
- Development libraries and headers for ncurses
- Development libraries and headers for zlib and openss
- Development libraries and headers for newt
- GCC and standard software build tools

It is recommended that you use the most recent version o
DAHDI, and libpri software for the best results. If you ha

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ing command to list the devices detected by the PCI b

```
# lspci -n
```

Confirm that the output from **lspci** lists a device with vendor ID which is “d161”. The screen output should following:

```
0000:01:00.0 0200:d161:<card identifier>
```

> **Note:** The output from **lspci** may or may not state device”. If it does, this does not indicate a problem

In the PCI device listing shown above, <card identifie populated with one of the identifiers listed in the table

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A Digium 800 Series (TDM800P/AEX800) card ident
listed. If a matching card identifier is not listed, then y
not PCI 2.2 (or higher) or PCI Express compatible, an
not work with your motherboard.

2. Download the latest DAHDI drivers with tools. DAHI
for download from:
http://downloads.digium.com/pub/telephony/dahdi-lin

```
# wget http://downloads.digium.com/pub/t
dahdi-linux-complete/dahdi-linux-complet
current.tar.gz
```


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```
# make install
# make config
```

Note: Executing ‘make config’ will install an init scri
which will allow you to start and stop DAHDI as a ser

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the command below. Asterisk is available for downloa
http://downloads.digium.com/pub/telephony/asterisk

```
# wget http://downloads.digium.com/pub/t
asterisk/asterisk-X.X-current.tar.gz
```

2. Expand the downloaded file, compile its contents, and
application. Substitute the version of Asterisk for the t
X.X.X in the command lines below.

```
# tar -zxvf asterisk-X.X-current.tar.gz
# cd asterisk-X.X.X/
# ./configure
# make menuselect
# make
# make install
```


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copy, any older Asterisk configuration files that you h
asterisk directory.

If your installation has failed, it may be because you a
or more of the build dependencies, the kernel headers,
development tools. Please contact your reseller where
purchased, or call Digium Technical Support at 1.256.
assistance.

Complete instructions for installing Asterisk are available
www.asterisk.org.

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software to meet your individual needs. Each section exp
options as examples. Once you have familiarized yoursel
samples, you can edit the configuration files to meet your

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your interfaces.

The following is a typical setup for a telco in the US:

```
loadzone = us
defaultzone = us
```


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system.conf:

```
fxsks =
```

fxsks uses kewlstart signalling, which is loopstart signalling supervision. For example, a TDM808E card would be confi following:

```
fxsks = 1-8
```

OR

```
fxsks = 1,2,3,4,5,6,7,8
```

You should have identified the type of 800 Series card whe If you are not sure, refer to **Module Identification** on pa assistance.

Note: The 800 Series cards do not support Ground

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```
fxoks = 1-8
```

OR

```
fxoks = 1,2,3,4,5,6,7,8
```

5. An example TDM844E card configuration would be:

```
fxoks = 1-4
fxsks = 5-8
```

OR

```
fxoks = 1,2,3,4
fxsks = 5,6,7,8
```

6. DAHDI uses modular echo cancellers that are configu
The echo cancellers are compiled and installed as part
linux package. You can specify the echo canceller to b
channel. The default behavior is for there to be no ech
any channel. So, it is very important that you specify

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The following is a typical setup using software-based
cancellation:

```
echocanceller = mg2,1-8
```

7. Load DAHDI drivers into the kernel using the **modpr**
appropriate driver for the 800 Series cards is **wctdm2**
should use the following modprobe command:

```
# modprobe wctdm24xxp
# dahdi_cfg -vv
# dmesg
```

Note: The 800 Series cards use the same driver as the

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```
Detected REG2: 0000001d
(pre) Reg fc is 50000027
(post) Reg fc is 50000024
Detected REG2: 0000ffff
TDM800P: reg is a04c0004
Resetting the modules...
During Resetting the modules...
After resetting the modules...
Port 1: Installed -- AUTO FXO (FCC mode
Port 2: Installed -- AUTO FXO (FCC mode
Port 3: Installed -- AUTO FXO (FCC mode
Port 4: Installed -- AUTO FXO (FCC mode
Port 5: Installed -- AUTO FXO (FCC mode
Port 6: Installed -- AUTO FXO (FCC mode
Port 7: Installed -- AUTO FXO (FCC mode
Port 8: Installed -- AUTO FXO (FCC mode
Found a Wildcard TDM: TDM800P (8 module
```

Figure 7: Example dmesg Screen Sh

Note: Output as shown above may vary depending on card you use.

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The following is a sample configuration for a TDM841E place this at the bottom of your **chan_dahdi.conf** file.

```
;General options
usecallerid = yes
hidecallerid = no
callwaiting = yes
threewaycalling = yes
transfer = yes
echocancel = yes
echocancelwhenbridged = yes
rxgain = 0.0
txgain = 0.0
;FXS Modules
group = 1
signalling = fxo_ks
context = Internal
channel = 1-4

;FXO Modules
group = 2
echocancel = yes
signalling = fxs_ks
context = Incoming
```

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Users without the VPMADT032 using open source echo
included with DAHDI should configure echocancel to the
(16ms) or 256 (32ms). Setting "yes" will default the optio

Users who have not purchased an 800 Series card with the
cancellation module are encouraged to take advantage of
Performance Echo Canceler software. This commercially
software, which is made available at no charge to in-warr
analog interface card customers, provide toll quality echo
performed on the host CPU, at up to 1024 taps (128ms) p
further details about HPEC, please refer to the Digium we

http://www.digium.com/en/products/software/hpec.php

When HPEC is enabled, users may set the value of the ec
parameter to any of the following values:

128 - 16ms
256 - 32ms
512 - 64ms
1024 - 128ms

> **Note:** Higher values will result in dramatically increas
> consumption. In order to optimize system performanc
> encouraged to choose the minimum value required to
> echo.

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In this example, **1234** is the mailbox number, **4242** is the
Spencer is the person's name, and **root@localhost** is his

You can add extensions by adding the following:

```
1000 => 1234,Moose Member,moose@digium.com
2000 => 1234,Bill Savage,bsavage@digium.co
```


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```
[internal]
exten => 1000,1,Dial(DAHDI/1,20,rt)
exten => 1000,2,Voicemail(1000,u)
exten => 1000,102,Voicemail(1000,b)

exten => 2000,1,Dial(DAHDI/2,20,rt)
exten => 2000,2,Voicemail(2000,u)
exten => 2000,102,Voicemail(2000,b)

exten => 8500,1,VoiceMailMain
exten => 8501,1,MusicOnHold

exten => _9.,1,Dial(DAHDI/g2/www${EXTEN:1}
exten => _9.,2,Congestion

[Incoming]
exten => s,1,Answer
exten => s,2,Dial(DAHDI/g1,20,rt)
exten => s,3,Voicemail(1000,u)
exten => s,103,Voicemail(1000,b)
```


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1. Start Asterisk by typing:

   ```
   asterisk
   ```

2. Connect to Asterisk and view the output by typing:

   ```
   asterisk -vvvvr
   ```

3. Dial tone should be present on phones connected to t
   Test your configuration by placing an outgoing call, p
   from extension 1 to 2, or receiving an incoming call.
   completion of these tasks indicates your configuratio
   properly.

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Figure 8: Sample Application

Note: More detailed information is provided at the As
(www.asterisk.org), as well as the Digium Knowledge
(kb.digium.com). You may also obtain assistance by c
Digium Technical Support at 1.256.428.6161 or visitin
www.digium.com.

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may be purchased. Each configuration consists of one to f
FXO modules. These modules are identified by their colo

- **FXS** - Foreign Exchange Station (Green Modules)
- **FXO** - Foreign Exchange Office (Red Modules)

This chapter provides an in-depth review of the two modu
their uses within your Asterisk server.

Note: Only qualified service personnel should install t
should not attempt to perform this function themselve

FXS Module

The FXS module allows an 800 Series card to initiate and
voltage to an FXO device such as an analog telephone.

FXO Module

The FXO module allows an 800 Series card to terminate a
lines (POTS). Because of the modular design, you can act
ports at any time with more FXS or FXO daughter cards.
module passes all the call features any standard analog tel
support. The phone receiving the call is the last FXO dev
When it receives voltage from an FXS device, the phone

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voltage using the FXS module and send it to your analog

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available to obtain more information about Asterisk and D
Please visit both www.digium.com and www.asterisk.org
information.

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I have echo problems on my FXO modules and I've tri
echo cancellation algorithms in dahdi_config.h, tried t
gains, and still nothing works. What can I do?

Run the fxotune utility with the -i option (fxotune -i 4). It
which DAHDI channels are FXO modules and tune them
warned however, it takes a significant amount of time for
tune. A conservative estimate would be somewhere arou
for each module. You only have to tune the channels onc
The fxotune utility will store the calibration settings in /e
You will need to configure your system to run fxotune wi
(fxotune -s) during the Linux boot sequence in order to in
previously discovered values which are stored in fxotune
recommendation is to put ‘fxotune -s’ in your distribution
at some point after the DAHDI module loads and before
executes.

> **Note:** The digit after the -i option is the digit that will
> on the line.

There is a slight echo. How can I adjust the sound qua

---

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3. You can also adjust the **rxgain** and the **txgain**, althou
recommended to shift between **-5** and **5**.

How can I enable more features?

To view all of the options available to add to your dial pla
following commands from within Asterisk:

```
*CLI> core show applications
*CLI> core show functions
```

Digium also offers services to help configure and add fea
need. Contact Digium Technical Support at 1.877.DIGIU
(1.877.344.4861) for more information.

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If the X Window System is running, stop the applicati
cause a conflict with Asterisk.

2. Check to see if your PATA IDE hard drives are runnin
levels set. Advance user can perform an **hdparm** on y
interface.

*Use hdparm with caution as the man page states t
corruption can occur when using incorrect settin
review the man page for hdparm and make sure y
the risks before using this tool.*

Check the current mode using this command:

```
hdparm -vi /dev/[IDE Device]
```

Use this command to set the drives into UDMA2 mod

```
hdparm -d 1 -X udma2 -c 3 /dev/[IDE Devi
```

If you are still having problems, contact your reseller from
was purchased, or Digium Technical Support at 1.877.DI
(1.877.344.4861).

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Monday - Friday.

2. Asterisk users mailing list (asterisk.org/lists.digium.co
3. IRC channel **#asterisk** on (irc.freenode.net).

Subscription Services Program

Digium is dedicated to supporting your Asterisk system b
technical support through our Subscription Services Prog
this program, you can be at ease knowing that your busin
have access to the Asterisk experts. Pricing on Subscriptio
be obtained from your nearest reseller or you may call Di
referral to your nearest reseller at +1.256.428.6000 or e-m
sales@digium.com.

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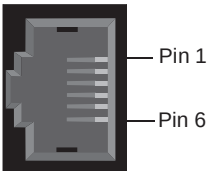
Table A-1: RJ11 Telco Port Connector

	Pin	Desc
	1	Not
	2	Not
	3	T
	4	R
	5	Not
	6	Not

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cards.

Physical (All Cards).

Size: 6.48” × 4.2” × 0.68” (16.46 x 10.67 x 1
PCB size, does not include the PCI brac
Check your model carefully to be sure it
this PCI card.

Weight: 4.5 oz (127.58 gm) with no modules loa
Each quad module adds 1 oz (28.35 g)

Interfaces.

Local Loop Access: Industry standard 6-pin RJ-11.

(TDM800P) - PCI Bus: 3.3V or 5V bus slot, half-length f
card, 33MHz minimum bus speed, compliant with PCI 2.
Additional Power: four-pin 12V connector for FXS powe
(required only if FXS modules are installed)

(AEX800) - PCI-E X1, compliant with PCI-E X1 1.0 or g

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Hardware and Software Requirements.

500-Mhz Pentium III or better
64MB RAM
Available PCI or PCI-Express Slot (as described pre

Power Consumption.

The following table lists the power consumption for both
card (and its permutations) and the AEX800 card (and its

Note: 3.3 and 5 volt power is taken from the PCI slot.
taken only from the four-pin hard disk drive connecto
PWR2400B.

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3.3V All AEX “E” models	4.5 W
5.0V All TDM “B” models	1W
5.0V All TDM “E” models	9W
5V All AEX models	0W
12V AEX/TDM804E	0W
AEX/TDM808E into 1REN	0W
AEX/TDM844E into 2REN	6.5W
AEX/TDM840E into 3REN	6.5W
AEX/TDM880E into 5REN	13W

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international communications.

asynchronous

Not synchronized; not timed to an outside clock source. T
controlled by start bits at the beginning and stop bits at th
character. Asynchronous communications are often found
access and remote office applications.

attenuation

The dissipation of a transmitted signal's power as it travel

bandwidth

The capacity to carry traffic. Higher bandwidth indicates
transfer more data in a given time period.

bit

The smallest element of information in a digital system. A
either a zero or a one.

bps *bits per second*

A measurement of transmission speed across a data conne

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A generic term for an individual data stream. Service pro
multiplexing techniques to transmit multiple channels ov
medium.

Cat5

Category of Performance for wiring and cabling. Cat 5 ca
applications up to 100 MHz.

Cat5E

Category of Performance for wiring and cabling. Categor
wiring supports signal rates up to 100 MHz but adheres t
specifications.

CLEC *competitive local exchange carrier*

A term for telephone companies established after the
Telecommunications Act of 1996 deregulated the LECs. C
with ILECs to offer local service. See also *LEC* and *ILEC*

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Terminal equipment which is connected to the telecommu
network and which resides within the home or office of th
includes telephones, modems, terminals, routers, and tele
boxes.

DAHDI *Digium Asterisk Hardware Device Interface*

A telephony project dedicated to implementing a reasona
affordable computer telephony platform into the world ma
the collective name for the Digium-provided drivers for D
telephony interface products.

DS0 *Digital Signal, Level 0*

A voice grade channel of 64 Kbps. The worldwide standa
digitizing voice conversation using PCM (Pulse Code Mo

DS1 *Digital Signal, Level 1*

1.544 Mbps in North America (T1) and Japan (J1) -up to
channels (DS0s), 2.048 Mbps in Europe (E1) - up to 32 v
(DS0s). DS1/T1/E1 lines are part of the PSTN.

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E1

The European equivalent of North American T1, transmit
Mbps, up to 32 voice channels (DS0s).

E3

The European equivalent of North American T3, transmit
Mbps, up to 512 voice channels (DS0s). Equivalent to 16

EMI *Electromagnetic Interference*

Unwanted electrical noise present on a power line

full duplex

Data transmission in two directions simultaneously.

FXO *Foreign Exchange Office*

Receives the ringing voltage from an FXS device. Outsid
connected to the FXO port on your 800 Series card.

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(ITU-T) for an algorithm designed to transmit and receiv
voice and A-law at a digital bit rate of 64 Kbps. This algo
digital telephone sets on digital PBX.

G.723.1

A recommendation by the Telecommunication Standardiz
(ITU-T) for an algorithm designed to transmit and receiv
telephone lines at 6.3 Kbps or 5.3 Kbps.

G.729a

A recommendation by the Telecommunication Standardiz
(ITU-T) for an algorithm designed to transmit and receiv
telephone lines at 8 Kbps.

H.323

A recommendation by the Telecommunication Standardiz
(ITU-T) for multimedia communications over packet-bas

IAX *Inter-Asterisk eXchange*

The native VoIP protocol used by Asterisk. It is an IETF s
enable VoIP connections between Asterisk servers, and b
and clients that also use the IAX protocol.

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The LECs that were the original carriers in the market pric
competition and therefore have the dominant position in t

interface

A point of contact between two systems, networks, or dev

ISO *International Standards Organization*

LED *light-emitting diode*

Linux

A robust, feature-packed open source operating system ba
that remains freely available on the internet. It boasts dep
offers a wide range of compatibility with hardware and so
is supported exclusively on Linux.

loopback

A state in which the transmit signal is reversed back as th
typically by a far end network element.

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interleaving bits one after the other.

MUX *multiplexer*

A device which transmits multiple signals over a single c
line or channel. See multiplexing.

PBX *private branch exchange*

A smaller version of a phone company's large central swi
Example: Asterisk.

PCI *peripheral component interconnect*

A standard bus used in most computers to connect periph

POP *point of presence*

The physical connection point between a network and a t
network. A POP is usually a network node serving as the
CO to a network service provider or an interexchange car

POTS *plain old telephone service*

The public switched telephone network (PSTN) is the net
world's public circuit-switched telephone networks. Origi

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PSTN *public switched telephone network*

A communications network which uses telephones to esta
connections between two points. Also referred to as the d

QoS *quality of service*

A measure of telephone service, as specified by the Publi
Commission.

RJ11

A six-pin jack typically used for connecting telephones, n
machines in residential and business settings to PBX or th
telephone CO.

SIP *Session Initiation Protocol*

An IETF standard for setting up sessions between one or
is currently the leading signaling protocol for Voice over
replacing H.323.

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A dedicated digital carrier facility which consists of 28 T
transmits data at 44.736 Mbps. Equivalent to 672 voice c

TDM *time division multiplexer*

A device that supports simultaneous transmission of multi
into a single high-speed data stream. TDM separates sign
interleaving bits one after the other.

telco

A generic name which refers to the telephone companies
world, including RBOCs, LECs, and PTTs.

tip and ring

The standard termination on the two conductors of a telep
named after the physical appearance of the contact areas

twisted pair

Two copper wires commonly used for telephony and data
communications. The wires are wrapped loosely around e
minimize radio frequency interference or interference fro
the same bundle.

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